
Appendix C FarmWare User's Manual

Version 2.0

Contents

Chapter 1. Introduction.....	1
Installing the FarmWare Software.....	1
The FarmWare Package	1
Required Equipment	1
Recommended Equipment	1
Installation Instructions	1
Chapter 2. FarmWare Interview/Quick Start.....	3
Chapter 3. Opening, Closing, and Saving FarmWare Sessions	5
New FarmWare Session.....	5
Open Existing FarmWare Session	5
Save FarmWare Session.....	5
Save FarmWare Session As.....	5
Close Current FarmWare Session.....	5
Print	5
Exit FarmWare	6
User Information	6
Chapter 4. Farm Design.....	7
Site Location and Climate	7
Farm Type.....	9
Management Train	11
Change Component	12
Erase Component.....	12
Design Component	13
Set Cost Fraction.....	14
Inspect Methane.....	15
Inspect Costs	16
Livestock Number.....	17
Livestock Facilities	18
Other Benefits.....	19
Energy Prices.....	20
Viewing Energy Payments	21
Enter Detailed Load Schedule	23
Enter Detailed Rate Schedule.....	24
Project Factors.....	25
Chapter 5. Methane Recovery Components.....	27
Anaerobic Lagoon	27
Collect Rainfall.....	28
Complete Mix Digester.....	28

Appendix C FarmWare User's Manual

Version 2.0

Compost	29
Dry Application.....	29
Drystack	30
Engine Generator	31
Flush.....	32
Liquid Application	33
Methane Recovery Lagoon.....	33
Mix Tank.....	35
Plug Flow Digester	35
Process Water.....	36
Pull Plug Pit.....	36
Scrape	37
Solids Separator	37
Storage Pond.....	38
Storage Tank	39
Chapter 6. Changing Default Costs	41
Editing Default Costs.....	42
Adding New Costs.....	42
Saving and Retrieving Changed Costs.....	42
Chapter 7. Analyzing the Costs and Benefits	43
Quick Financial Results.....	43
Summary Report	43
Cashflow Report.....	44
Farm Energy Balance.....	45
Chapter 8. Help and Other Features.....	47
Help.....	47
Contents	47
Keyword	47
About.....	47
Window Options.....	47
Cascade.....	48
Tile	48
Arrange Icons.....	48
Close All	48
Minimize All.....	48
Restore All	48
Index.....	49

CHAPTER 1. INTRODUCTION

Welcome to AgSTAR FarmWare, a computerized decision support system that determines whether a methane recovery facility can increase your farm's profits. FarmWare first evaluates whether a methane recovery facility can be integrated into your farm's existing or planned manure management system. FarmWare then estimates how much the methane recovery system will cost and how much you can earn by producing energy for on-farm use.

Installing the FarmWare Software

Before you begin working with FarmWare, check the contents of your FarmWare package, make sure you have the correct equipment to run the program, and read through the rest of this section to be sure you have a clear understanding of the installation procedure.

The FarmWare Package

Your FarmWare package includes the following:

- 3½ inch FarmWare program disk located in plastic sheet in this Handbook and
- FarmWare manual (this Appendix)

Required Equipment

- An IBM compatible computer with a 386SX or better processor with at least 4MB RAM;
- Microsoft Windows 3.1 or later; and
- Hard disk with at least 8 MB of space available.

Recommended Equipment

- **Color monitor** - FarmWare operates on a monochrome monitor; however, some screens are difficult to read. We suggest using a screen resolution greater than 640 x 480
- **Mouse** - If you do not have a mouse, it is possible (though rather inconvenient) to FarmWare using keyboard controls. File menu options may be accessed by clicking the Alt key and the underscored letter in the menu option (e.g., to access the **F**ile menu, click **Alt+F**).
- **Printer** - You may wish to print a hard copy of FarmWare's results.

Installation Instructions

To install FarmWare on your computer, follow the instructions below:

1. Insert the FarmWare disk 1 into your floppy disk drive (A or B).
2. Click on the **F**ile menu of your **Windows Program Manager** and select **R**un.
3. Type **a:\install** (or **b:\install**) and click OK.
4. Follow the instructions during the installation process, making sure that you select the default directory. **FarmWare will not be installed correctly if you modify the default drive or directory.**
5. Read the message in the instruction screen at the end of the installation process and double click on the upper left hand corner to continue.

To run FarmWare, double click on the FarmWare icon, or click on the **File** menu of the Windows Program Manager, select **Run**, and type c:\farmware\farmware.exe (or d:\farmware\farmware.exe or e:\farmware\farmware.exe, depending on where you install the FarmWare program files).

After FarmWare has loaded, it will display the "Welcome to FarmWare" screen. To begin the program, click on Yes.

If you have any questions regarding the above installation procedure, please call the AgSTAR Hotline at 1-800-95AgSTAR (1-800-952-4782).

CHAPTER 2. FARMWARE INTERVIEW/QUICK START

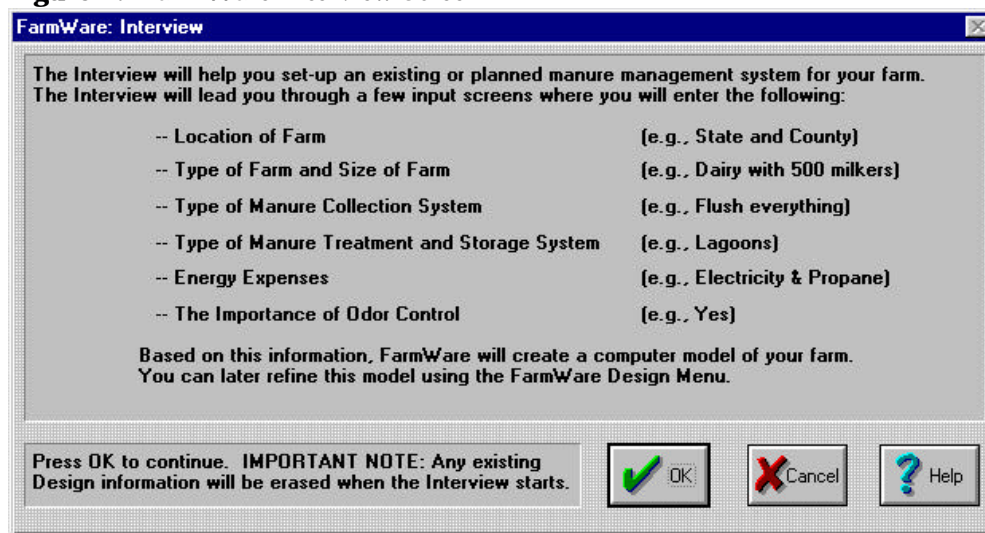
Users who are not familiar with FarmWare are advised to use the FarmWare Interview. The interview may be accessed by selecting **Interview** from the **Interview** menu or by clicking "OK" in the welcome screen (Figure 1).

Figure 1: FarmWare Welcome Screen



The first interview screen pops up as shown in Figure 2 below:

Figure 2: FarmWare Interview Screen



To continue with the interview, click on the OK button. To cancel, click on the Cancel button. **Note: Any existing design information will be erased when the interview starts.**

The interview takes you through the following screens in the order described below. For information about these FarmWare screens, refer to the description on the page indicated.

Step 1. Site Location and Climate (page C-7)

Step 2. Farm Type (page C-9)

Step 3. Energy Prices (page C-20)

Step 4. Odor and Other Benefits (page C-19)

Step 5. Project Financial Assumptions (page C-25)

Step 6. Quick Financial Report (page C-43)

CHAPTER 3. OPENING, CLOSING, AND SAVING FARMWARE SESSIONS

FarmWare is set up like many other software systems. FarmWare session files may be opened, closed, and saved using options in the **File** menu (Figure 3). Each of these options is described below.

Figure 3: File menu***New FarmWare Session***

To clear the current FarmWare session and begin a new one, select **New FarmWare Session** from the **File** menu. Before beginning a new session, FarmWare displays a message asking if you wish to save any existing design information. All existing design information that is not saved will be erased upon beginning a new session.

Open Existing FarmWare Session

To open an existing FarmWare session, click on the retrieve icon (Figure 4) on the toolbar or select **Open Existing FarmWare Session** from the **File** menu. Type the name of the file you wish to open in the Filename box or select the file you want to open using the drive, directory, and file lists.

Figure 4: Retrieve icon***Save FarmWare Session***

To save a FarmWare session, click on the save icon (Figure 5) on the toolbar or select **Save FarmWare Session** from the **File** menu. When using **Save**, the copy you have been working on replaces the saved copy on disk. If you have not saved the session before, FarmWare will prompt you to name it.

Figure 5: Save icon***Save FarmWare Session As...***

To save a new FarmWare session or to save the current session with a new name or in a different directory, select **Save FarmWare Session As...** from the **File** menu, then select the drive where you want to save the new or renamed file from the Directories list box or the QuickList. Type the name of the file or select the file you want to replace with the saved file. Choose OK to save.

Close Current FarmWare Session

To close the current FarmWare session, select **Close FarmWare Session** from the **File** menu. FarmWare prompts you to save any existing design information before closing. All unsaved design information will be lost upon making this selection.

Print

To print a copy of the screen you are working on, click the print icon (Figure 6) on the toolbar or choose **Print** from the **File** menu. The following screens may be printed in FarmWare: Management Train (page C-11), Livestock Number (page C-17), Livestock Facilities (page C-18), Cashflow Report (page C-44), Energy Balance (page C-45), Methane Inspector (page C-15), Cost Inspector (page C-16), and Cost

Figure 6: Print icon

Data (page C-41). Upon selecting **Print** the FarmWare word processor is opened and the above screens are printed in tables. These printouts may be edited in the FarmWare word processor or saved and opened in a different word processor. A hard copy may be printed directly from the FarmWare word processor by selecting Print from word processor File menu. The FarmWare word processor may be closed by double clicking in the upper left hand corner of the word processor screen.

Exit FarmWare

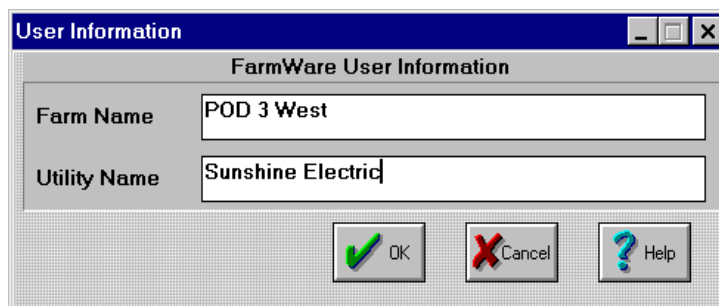
To exit FarmWare, click on the exit icon (Figure 7) on the toolbar or select **Exit FarmWare** from the **File** menu. *Note: Any work which has not been saved prior to exiting will be erased.*



User Information

Basic information about the farm being analyzed in the current FarmWare session may be entered by selecting **User Information** from the **Data** menu. The **User Information** dialog pops up as shown in Figure 8 below.

Figure 8: User Information Dialog



The dialog box is titled "User Information" and contains a section titled "FarmWare User Information". It has two text input fields: "Farm Name" with the text "POD 3 West" and "Utility Name" with the text "Sunshine Electric". At the bottom, there are three buttons: "OK" with a green checkmark icon, "Cancel" with a red X icon, and "Help" with a blue question mark icon.

The name of the farm and the name of the farm's utility may be entered in the appropriate boxes. This information is used in the **Summary Report** (see page C-43). Click on OK to save and exit this screen.

CHAPTER 4. FARM DESIGN

The **Design** menu (Figure 9) contains options which allow you to describe the characteristics of your farm and its methane recovery components. Not all of the options may be available at one time. An option is available if it is displayed in **BOLD** in the menu. As you enter data required in certain Design screens, additional Design options become available. You should go into each Design screen to ensure that the characteristics of your manure gas recovery facility are designed accurately.

Most of the options in the **Design** menu may also be accessed by clicking on corresponding icons on the toolbar. Design icons are displayed only when they may be accessed by the user. A small, green dot above the icon indicates that the option is available for use but has not yet been opened and/or edited. In other words, the option is available but has been designed using default data. A small gray checkmark above the icon indicates that the option has been opened by the user. The FarmWare user should open each option to examine the default values and edit if necessary. A good rule of thumb is to be sure that there are checkmarks above each Design icon before viewing the Analysis options to be sure that you have designed each option to accurately represent the features of your farm.

The options contained within the **Design** menu are described in the following sections.

Site Location and Climate

The purpose of the Location and Climate screen is to select the location of the farm and the climatic conditions at this location. This information is important as it is used to calculate methane production, a calculation which is dependent upon temperature. This information is also important as it is used to size the treatment and storage facility such that it can hold precipitation from the 25 year, 24 hour storm event.

Select this screen by clicking on the climate icon (Figure 10) on the toolbar or selecting **Location and Climate** from the **Design** menu. The **Site Location and Climate Screen** will look similar to Figure 11 below.

Figure 9: Design menu

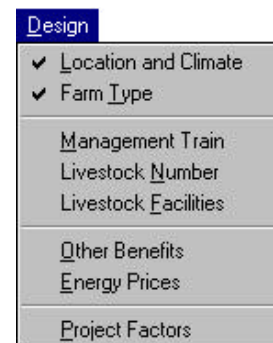


Figure 10: Location and climate icon



Figure 11: Site Location and Climate screen

FarmWare: Site Location and Climate

Enter your farm's state and county. The system will retrieve the average monthly temperature and rainfall. Or, read custom climate data from a climate data file you've created previously.

Enter State:

Enter County:

Use AgSTAR Database ☐

Use Your Custom Data ☐

Rec. Min. Lagoon HRT Days

Rec. Max. Lagoon Loading lb VS/1000 cu.ft.

25 Yr 24 hr Storm Inches of rain

Annual Runoff (Unpaved) Percent of Precip.

Annual Runoff (Paved) Percent of Precip.

Annual Evaporation Inches

	Temp(F)	Rain(in)
January	50.5	1.0
February	54.3	0.8
March	58.5	1.0
April	65.7	0.3
May	67.4	0.2
June	83.6	0.2
July	89.3	1.1
August	87.0	1.5
September	81.7	0.8
October	71.2	0.8
November	58.7	0.7
December	51.5	1.1
Avg/Total	68.3	9.5

OK Cancel Help

State and County

Enter the state and county in which your farm is located by scrolling through the “Enter State” and “Enter County” drop down lists. All 50 states as well as Guam, Puerto Rico, and the Virgin Islands are listed. If you wish to analyze the methane recovery potential for a farm in a location not listed, you may either select a location with a similar climate to the unlisted location or select “Other” and manually enter the temperature and rainfall data.

Default Monthly Temperature and Rainfall

The table on the right side of this screen shows the default monthly temperature (in °F) and rainfall (in inches) values for the selected state and county. Any of the values in the cream colored boxes may be edited if necessary. Simply click into the box and type the correct value. The average or total is recalculated in the blue cells in the last row.

Other Location and Climate Values

Default values for other location and climate factors used by FarmWare are listed in the lower left hand corner of this screen. These factors include:

- Recommended minimum lagoon HRT in days
- Recommended maximum lagoon loading in lb VS/1000 ft³
- 25 year, 24 hour storm event in inches
- Annual runoff of unpaved surfaces as a percent of the precipitation
- Annual runoff of paved surfaces as a percent of the precipitation
- Annual evaporation in inches

Any of these values may be edited if necessary. Simply click into the white box, delete the current value, and type the more accurate number.

Saving and Retrieving Custom Climate Data

You may wish to save any changed climate data for use in a later session. Changed climate data is called "custom data".

To save or retrieve "custom data", click in the white switch box adjacent to the words "Use Custom Data". You should see two new icons, a save climate icon (Figure 12) and a retrieve climate icon (Figure 13).

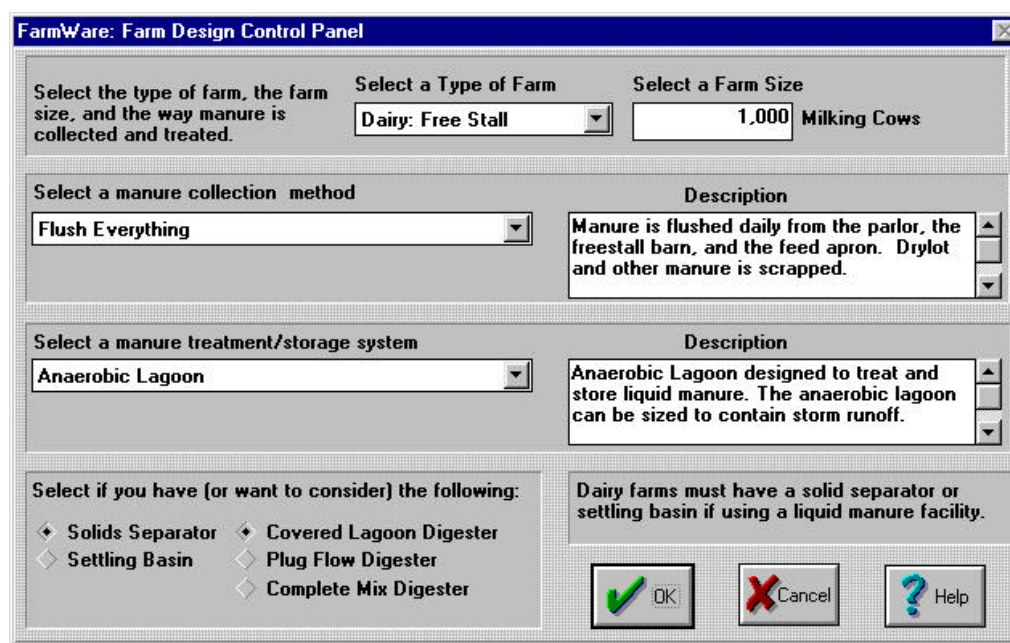
To save "custom data", click on the save climate icon, type the name of the file you wish to save with a *.clm extension, and click on OK to save. To retrieve "custom data", click on the retrieve climate icon, type the name of the file you wish to retrieve, and click on OK to open.

Farm Type

The Farm Type screen allows you to enter the farm type, farm size, manure collection facility, and manure treatment/storage facility. This information is used to set up the manure management train (see page C-11).

Select the Farm Type screen by selecting **Farm Type** from the **Design** menu or clicking the farm type icon (Figure 14) on the toolbar. The **Farm Design Control Panel** will look similar to Figure 15 below.

Figure 15: Farm Design Control Panel


Farm Type

Select the farm type from the "Select a Type of Farm" drop down list. Currently, FarmWare supports only dairy and swine farms. The available farm types include:

- Dairy: Free Stall
- Dairy: Tie Stall
- Dairy: Drylot

Figure 12: Save climate icon



Figure 13: Read climate icon



Figure 14: Farm type icon



- Swine: Farrow to Finish
- Swine: Farrow to Wean
- Swine: Farrow to Nursery
- Swine: Farrow to Grower
- Swine: Finisher
- Swine: Other

Choose the farm type which most accurately represents your farm.

Farm Size

Enter the size of the farm in the "Select a Farm Size" box. Be sure to enter only the number of the type of animals indicated to the right of the box. For example, for dairy farms, enter only the number of *milking cows* on your farm. You may modify the numbers of the other animal categories in the Livestock Number screen (page C-17).

Manure Collection Method

Select a manure collection facility from the "Select a Manure Collection Method" drop down list. The collection system should describe how the manure is captured and gathered from the point of origin and transferred to the storage/treatment facility. The manure collection options vary depending on the selected farm type. A description of each of these options is given in the box to the right of the selection box. If none of the options accurately describes your current or future management plans, you may select the "Other" option and describe your facility in the Management Train screen (page C-11).

Manure Treatment Method

Select the manure treatment and/or storage facility from the "Select a Manure Treatment/Storage Facility" drop down list. These facilities include the components of the manure management system which are designed to temporarily store and/or physically, biologically, or chemically treat the manure. treatment facility. The manure treatment options vary depending on the selected farm type. A description of each of these options is presented in the box to the right of the selection box. Choose the storage/treatment facility which most accurately describes the system at your farm. If none of the options accurately describes your current or future management plans, you may select the "Other" option and describe your system in the Management Train screen (page C-11).

Separator and Digester

If you want to use a solids separator or some type of methane recovery facility, click the appropriate check box(es) in the lower left hand corner of this screen. For dairy farms, FarmWare requires that you include a solids separator or settling basin. As a default, "Covered Lagoon Digester" is checked for each combination of collection and liquid storage/treatment facilities. You may click "Plug Flow Digester" or "Complete Mix Digester" if either more accurately describes the current or future methane recovery plans for your farm.

When you are finished entering all of the above information, you may click on OK to save and continue.

*Note: When you click on OK, you may receive a message telling you that your selected combination of manure collection and treatment storage facilities is not compatible. You may either click on **Retry** to go back to select another combination or click on **Ignore** to accept your combination and continue. If you choose Ignore and continue however, you will have to enter the individual manure management components separately in the **Management Train** screen (page C-11).*

Management Train

The Management Train screen allows you to define the components of the manure management system. To access this screen, click on the management train icon (Figure 16) on the tool bar or select **Management Train** from the **Design** menu. The **Manure Management Train Control Panel** looks similar to Figure 17.

Figure 16:
Management train icon



Figure 17: Manure Management Train Control Panel

Manure Management Train Control Panel				
	Collection	Component 1	Component 2	Component 3
Parlor	<i>Flush</i>	<i>Sld Separator</i>	<i>Anaerobic Lagoon</i>	<i>Fld Apply-Liq</i>
Free Stall Barn	<i>Flush</i>	<i>Sld Separator</i>		
Feed Apron	<i>Flush</i>	<i>Sld Separator</i>		
Drylot	<i>Scrape</i>	<i>Drystack</i>	<i>Fld Apply-Dry</i>	
Barn	<i>Flush</i>	<i>Sld Separator</i>		
Process Water	<i>Use Process Water</i>	<i>Sld Separator</i>		
Watershed	<i>Collect Rainfall</i>	<i>Anaerobic Lagoon</i>		
Methane Shack	<i>Engine generator</i>			
<i>Italics = Default Design</i> Non-Italic = User Design				

The first column in this screen presents the facility types, the second column presents the manure collection methods, and the third and subsequent columns present the components of the manure treatment/storage facility. The combination of all of these components is called the **manure management train**.

*Note: If you do not see components listed in the individual columns, FarmWare does not have a saved manure management train for your selected manure management combination. You must select each component separately. See **Change Component** below for more details.*

Initially, the component names in the manure management train are presented in italics as shown in Figure 17. Italicized text indicates that the components are defined using default values. If any of a component's default values are edited, the component's name is displayed in non-italicized text. See **Define Component** below for more details on how to accurately define the manure management train components at your farm.

In the **Management Train** screen, similar colors identify identical components. For example, in Figure 17, there is only one solid separator through which manure from all of the facilities except the drylot is flushed. To show this, the text for the "Sld Separator" is displayed in the same non-black color for each facility. Of identical components displayed in the same color, larger typeface indicates the cell which should be defined. In Figure 17, this cell is Component 2 for the parlor. Additionally, subsequent components are not listed for small typeface components as they are identical to those defined following the larger typeface. In Figure 17, the components "Anaerobic Lagoon" and "Field Apply-Liq" are not listed for the Freestall Barn, Feed Apron, and Barn since they are assumed to be identical to those listed for the Parlor.

Upon entering this **Management Train** screen, a new menu title in the menu bar titled **Tools** as well as a floating toolbar (Figure 18) are displayed. The options listed in this menu and this floating toolbar will you

Figure 18:
Management train floating toolbar



to fine tune your manure management train to accurately represent the manure management system at your farm. Each of these options are described in detail below.

Change Component

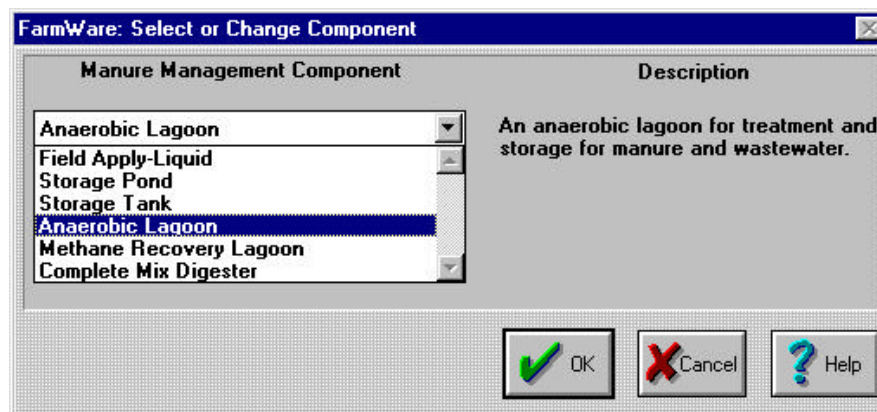
The **Change Component** option allows you to change one of the displayed components of the manure management train. To change a component, highlight the cell containing the component you wish to edit and either select **Change Component** from the **Tools** menu, press **Shift+F9**, or click on the change component icon (Figure 19) in the floating toolbar.

Figure 19: Change component icon



The **Select or Change Component** screen is displayed as shown in Figure 20. Select the desired component by scrolling through the drop down list and viewing the component descriptions to the right of the selection box.

Figure 20: Select or Change Component screen



When you are finished, click on OK to save and continue.

*Note: You should define and describe the components in more detail after you have selected them. See **Design Component** below.*

Erase Component

The **Erase Component** option allows you to delete a listed component of the manure management train. To delete a component of the manure management train, press **Shift+F12**, select **Erase Component** from the **Tools** menu, or click on the erase component icon (Figure 21) in the floating toolbar.

Figure 21: Erase component icon



Note: All of the components following an erased component will also be erased. For example, if the Solid Separator in Figure 17 is erased, the Anaerobic Lagoon and Fld Apply-Liq components will also be erased.

Design Component

The **Design Component** feature allows you to edit the defaults used to design each of the components in the manure management train. Each component has a Control Panel screen where the parameters are designed. To access the Control Panel for a particular component, highlight the component you wish to design (remember, only design components with LARGE typeface) and double click the cell, press F2, select **Design Component** from the **Tools** menu, or click on the design component icon (Figure 22) in the floating toolbar.

Figure 22: Design component icon



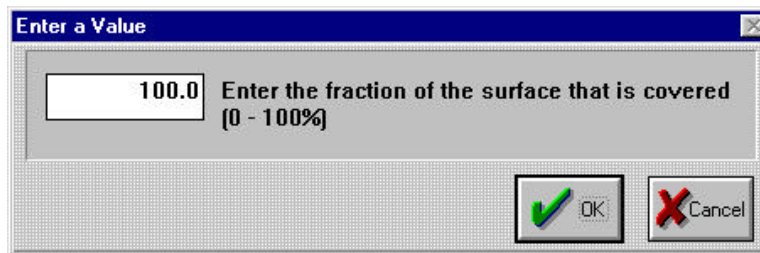
Figure 23: Anaerobic Lagoon Control Panel

	Quantity	Volume	TS	VS	N	P	K	TS
	lbs.	cu.ft.	lbs.	lbs.	lbs.	lbs.	lbs.	pct
Influent	459,856	7,407	10,575	9,488	0	0	0	2.29
plus Net Rainfall	45,300	730	0	0	0	0	0	0.00
minus Reduced by	30,112	485	3,764	7,528	0	0	0	12.50
equals Effluent	475,044	7,652	6,811	1,960	0	0	0	1.43
Calculated								
HRT (days)	44	133.4	Size Method					
Loading(lbVS/1000ft3)	10.0	9.6	Max of HRT & Loading					
Depth (ft)	20.0	Hold Watershed Runoff						
Length/Width Ratio	1.00	Minimum Volume	948,792	Yes				
Length(ft)	279	Sludge Volume	0	Cover Fraction				
Width(ft)	279	Net Rainfall Volume	38,974	100				
Side Slope(hor/ver)	2.5	OPERATING VOLUME	987,766	Cover material				
Freeboard (ft)	1.0	Freeboard Volume	76,374	Low durability (\$)				
Avg Evap(in./month)	3.3	TOTAL VOLUME (ft3)	1,064,140					
		Surface Area (sq.ft.)	77,841					

Withdrawals

OK Cancel ? Help Reset

Figure 23 shows the Control Panel for the anaerobic lagoon. Like each of the other Control Panels, Figure 23 shows the amount of manure and/or water influent which is entering the component based on what was entered in the previous screens. Any of the features in the cream colored boxes may be designed based on this influent and the capacity of your equipment. To change a value in the Control Panel, double click on the appropriate cream colored box. A dialog box pops up in which you may edit the value you wish to change. For example, if you double click on the cream colored cell beneath the words "Cover Fraction" in the Anaerobic Lagoon Control Panel, the Cover Fraction Dialog Box (Figure 24) pops up in which you may edit the fraction of the lagoon surface that is covered. Similar dialog boxes pop up for the other editable values in this and other Control Panels.

Figure 24: Cover Fraction Dialog Box

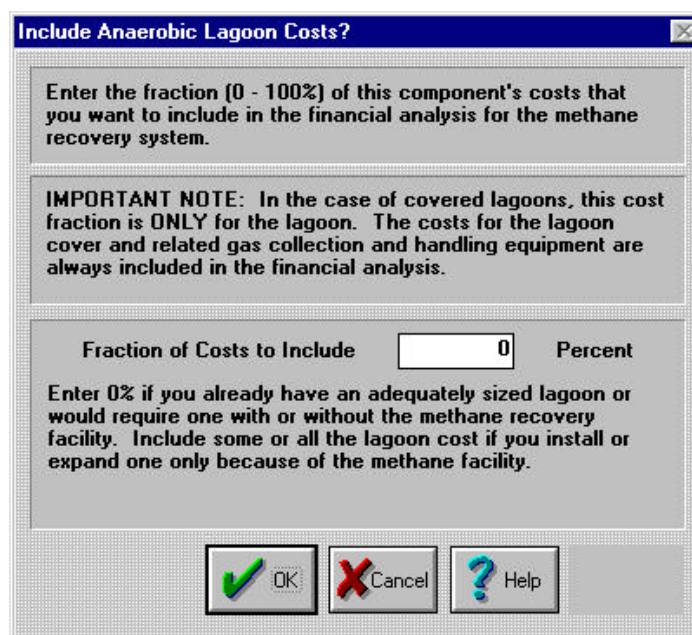
More detailed descriptions of the Anaerobic Lagoon Control Panel and the other components are presented in Chapter 5 - Methane Recovery Components.

Set Cost Fraction

The **Set Cost Fraction** option allows you to include some, part, or none of the costs associated with a manure management train component in the financial analysis. The **Set Cost Fraction** feature should be used if you already have a component recommended in the manure management train. For instance, you may already own a solids separator or you may already have a lagoon used for manure storage. If you do have a component, you do not need to factor its cost into the final financial analysis.

Figure 25: Set cost fraction icon

To set a cost fraction, highlight the component you wish to set the cost of, press Shift+F2, select **Set Cost Fraction** from the **Tools** menu, or click on the set cost fraction icon (Figure 25) in the floating toolbar. You will see a screen similar to Figure 26. Enter the fraction (0-100%) of this component's costs that you want to include in the financial analysis for the methane recovery facility.

Figure 26: Set Cost Fraction screen

When you are finished, click on OK to save and continue.

Inspect Methane

The **Inspect Methane** option allows you to view the amount of methane generated in a methane recovery component. These components include anaerobic lagoons, methane production lagoons (primary and secondary lagoons), plug flow digesters, complete mix digesters, and storage ponds.

To inspect the methane production from one of these components, click on the cell containing the methane recovery component and press F3, select **Inspect Methane** from the **Tools** menu, or click on the inspect methane icon (Figure 27) in the floating toolbar. The **Methane Inspector** screen for anaerobic lagoons, primary lagoons, secondary lagoons, and storage ponds looks similar to Figure 28.

Figure 27: Inspect methane icon



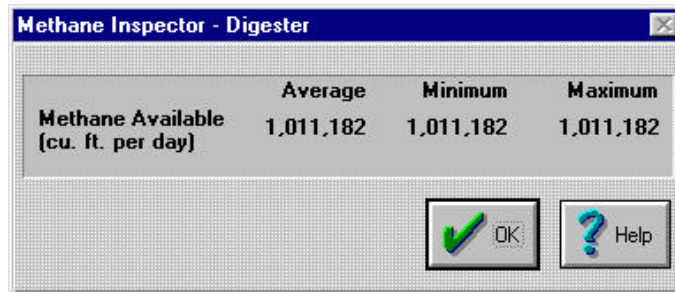
Figure 28: Methane Inspector Screen for Anaerobic Lagoons, Primary Lagoons, Secondary Lagoons, and Storage Ponds

Methane Inspector - Anaerobic Lagoon					
	Amb. Temp.	Lagoon Temp.	Rainfall	Methane	Biogas
Units	Deg F.	Deg F.	inches	Produced(ft3/day)	Rate (ft3/lbVS)
January	45.0	45.0	4.0	816,581	4.7
February	48.0	48.0	4.0	969,029	6.2
March	55.0	55.0	5.0	1,082,598	6.3
April	63.0	63.0	3.0	1,157,589	6.9
May	71.0	71.0	3.0	1,215,411	7.0
June	77.0	77.0	3.0	1,266,897	7.6
July	80.0	80.0	4.0	1,283,472	7.4
August	79.0	79.0	3.0	1,274,756	7.4
September	74.0	74.0	3.0	1,236,728	7.4
October	64.0	64.0	2.0	1,148,223	6.6
November	54.0	54.0	2.0	1,069,034	6.4
December	47.0	47.0	4.0	900,812	5.2
Avg/Total	63.0	63.0	40.0	1,118,428	6.6

You may view the various parameters in this screen by scrolling left and right. Methane production is broken down by each month. You may see a variation in methane production by month as the temperature affects the methane production rate. The fourth column in this table shows the methane production in cubic feet per day and the last column in this table lists the methane production in cubic meters per day.

You may not enter/edit the information in this screen. To exit this screen, double-click on the upper left hand corner of the window.

The **Methane Inspector** screen for complete mix digesters and plug flow digesters looks similar to Figure 29.

Figure 29: Methane Inspector Screen for Complete Mix Digesters and Plug Flow Digesters

This screen shows only the average, minimum, and maximum methane production per day. These values should not vary by month as the temperature within the digester is fixed. This screen may be closed by clicking on the OK button.

Inspect Costs

The **Inspect Costs** feature allows you to view the costs of the individual methane recovery components. To inspect the cost of a component, highlight the component you wish to inspect and press F4, select **Inspect Costs** from the **Tools** menu, or click on the inspect costs icon (Figure 30) in the floating toolbar. A sample **Cost Inspector** screen is shown in Figure 31 for a solid separator.

Figure 30: Inspect costs icon**Figure 31:** Solid Separator Cost Inspection Screen

Separator Costs	
Separator Cost	\$20,000
Other Costs	\$0
Total Separator	\$20,000
Total	\$20,000

If you wish to inspect the costs of a manure management component which has a cover (e.g., anaerobic lagoon and methane recovery lagoon), be sure to enter the percentage of the component you wish to cover in the appropriate **Design** screen. Additionally, if you already have some or all of the component, be sure to set the component's cost fraction (See **Set Cost Fraction** above).

*Note: The costs displayed in the Cost Inspection screens MAY NOT be edited. Default cost values may be edited by selecting a cost component under the **Data / Costs** menu. See Chapter 6 - Changing Default Costs on page C-41 for more details.*

You may close the Cost Inspector screen by double clicking in the upper left hand corner.

Livestock Number

To enter/edit the number of animals on your farm, click on the livestock number icon (Figure 32) on the toolbar or select **Livestock Number** from the **Design** menu. The livestock control panel looks similar to Figure 33.

Figure 32: Livestock number icon



Figure 33: Livestock Number Control Panel

Livestock Control Panel					
	Number	Weight	Manure	VS	Manure
Units	Head	lbs	lbs/day/AU	lbs/day/AU	lbs/day
Sow	2,000	400.0	60.0	5.4	48,000
Nursery	4,600	30.0	106.0	8.8	14,628
Grower	6,100	70.0	63.4	5.4	27,071
Finisher	6,900	180.0	63.4	5.4	78,742
Boar	100	450.0	20.5	1.7	922
None	0	0.0	0.0	0.0	0
None	0	0.0	0.0	0.0	0
Total	19,700	134.6	72.7	6.1	169,365
AU=1000 lbs					
To change livestock: Dbl Clk row labels or press Shift+F9					

This screen shows the default average number of animals based upon the farm size number you entered in the **Farm Type** (page C-9) screen. This screen also shows the default animal characteristics of each animal type (e.g., weight, manure production rate, etc.).

You may edit any of the values with the cream colored background to accurately represent the characteristics of the livestock at your farm by clicking in the box you wish to edit, entering the correct value, and pressing Return to save.

Note: You can enter/edit data into most cells that have a cream colored background.

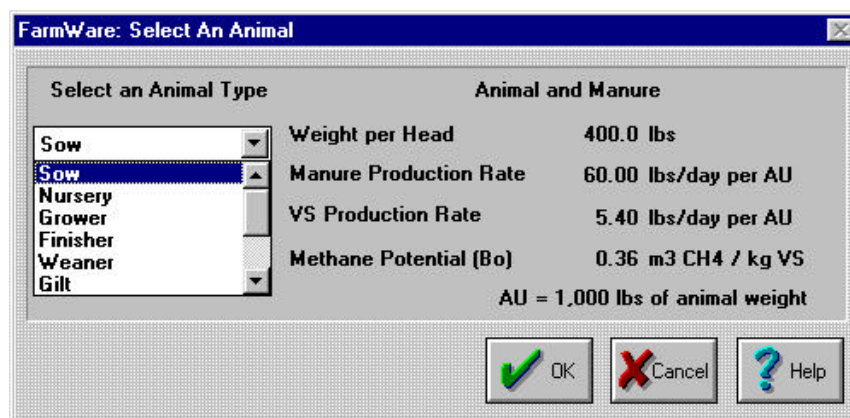
A new menu on the menu bar titled **Tools** (Figure 34) and a new toolbox are displayed on your screen. If you need to edit or delete an animal name (e.g., if you do not have any Bulls on your Dairy Farm), highlight the name of the animal and select **Change Livestock** from the **Tools** menu, click on the change livestock icon (Figure 35) in the toolbox, or press **Shift+F9**. The **Select an Animal** screen is displayed as shown in Figure 36. Select a different animal type from the drop down menu. Click OK to save and continue.

Figure 34: Livestock Number "Tools" menu



Figure 35: Change livestock icon



Figure 36: Change Livestock Dialog Box

Close the **Livestock Number** screen by either double clicking on the screen's close button (the square button in the upper left hand corner directly adjacent to the left of the File menu), pressing **CRTL+F4**, or selecting **Close Current Window** from the **Window** menu.

Note: This screen (and most of the subsequent screens) do not have to be closed in order to continue. You may leave it open on your desktop and continue with other options.

Livestock Facilities

The **Livestock Facilities** option allows you to enter/edit the types of facilities on your farm and/or estimate the approximate number of hours the animals spend in each facility. To edit the livestock facilities, select **Livestock Facilities** from the **Design** menu or click the facilities icon (Figure 37) on the toolbar. The facility control panel looks similar to Figure 38.

Figure 37: Livestock facilities icon**Figure 38:** Facility Control Panel

	Cow-Lac	Cow-Dry	Heifer	Calf	Bull	None
Parlor	3.0	0.0	0.0	0.0	0.0	0.0
Free Stall Barn	7.0	7.0	7.0	7.0	0.0	0.0
Feed Apron	10.0	10.0	10.0	10.0	10.0	0.0
Drylot	4.0	7.0	7.0	7.0	14.0	0.0
Barn	0.0	0.0	0.0	0.0	0.0	0.0
Process Water	0.0	0.0	0.0	0.0	0.0	0.0
Watershed	0.0	0.0	0.0	0.0	0.0	0.0
Total	24.0	24.0	24.0	24.0	24.0	0.0
Enter Hours per day each animal spends in each facility.						

This screen presents a table listing the hours that each animal type spends in each facility. The totals for each animal should add up to 24, though you may enter fewer. To edit the hours, click on the appropriate cream colored cell, enter the correct number of hours, and press Return to save. Any cell that has an active facility and an active livestock type may be edited.

A new menu on the menu bar titled **Tools** (Figure 39) and a new toolbox are displayed on your screen. If you need to edit or change a facility name, highlight the facility name you wish to edit and select **Change Facility** from the **Tools** menu, click on the change facility icon (Figure 40), or press **Shift+F9**. The **Change Facility** screen is displayed as shown in Figure 41. Select a new facility from the drop down list.

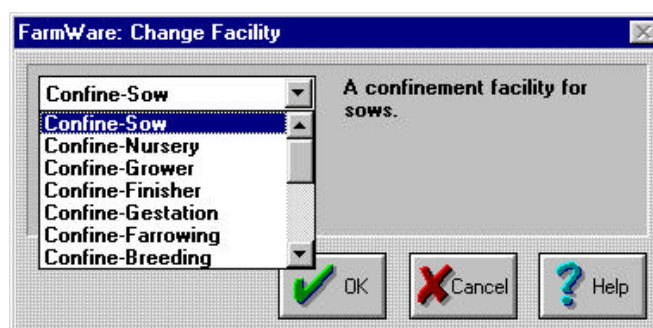
Figure 39: Livestock Facility "Tools" menu



Figure 40: Change facility icon



Figure 41: Change Facility screen



Click on OK to save and continue.

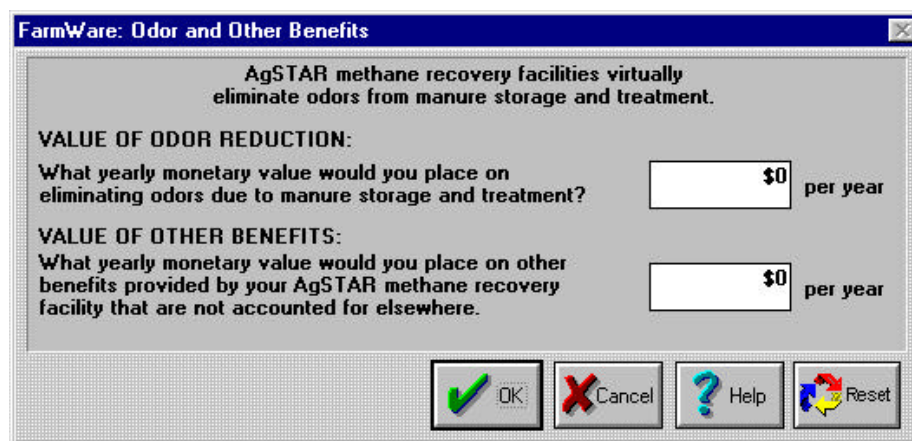
Close the **Livestock Facility** screen by either double clicking on the screen's close button (the square button in the upper left hand corner directly adjacent to the left of the File menu), pressing **CRTL+F4**, or selecting **Close Current Window** from the **Window** menu.

Other Benefits

The **Other Benefits** option allows you to enter the importance of odor and other benefits, (e.g., savings on lagoon cleanings, sale of manure solids, etc.) potentially received from the installation of a methane recovery facility. To enter other benefits, click on the benefits icon (Figure 42) on the tool bar or select **Other Benefits** from the **Design** menu. The **Odor and Other Benefits** screen pops up as shown in Figure 43.

Figure 42: Benefits icon



Figure 43: Odor and Other Benefits screen

Enter the value of odor reduction and other benefits in the corresponding boxes. If these values are not to be considered in the financial analysis you may enter \$0. Click OK to save and continue.

Energy Prices

The **Energy Prices** option allows you to enter the costs of electricity and/or propane to your farm. This information is important as it is used to estimate the benefits of on-farm energy use from the recovered methane. In other words, the cost of the energy is used to estimate the benefit of the energy produced.

To enter the energy prices, click on the energy icon (Figure 44) on the tool bar or select **Energy Prices** from the **Design** menu. The **Energy Usage and Payments** screen looks similar to Figure 45.

Figure 44: Energy prices icon

Figure 45: Energy Usage and Payments Dialog

FarmWare: Energy Usage and Payments

CURRENT ELECTRICITY USAGE AND PAYMENTS

How much electricity do you use per year (kWh) ? or

What price do you pay per kWh of electricity (\$) ? or

Your annual electricity bill should then equal:

Relative to the general annual inflation rate, how do you expect annual electricity prices to change over the lifetime of the project?

CURRENT PROPANE USAGE AND PAYMENTS

How much propane (or equivalent) do you use per year (gallons) ?

What price do you pay per gallon of propane (\$) ?

Your annual propane bill should then equal:

Relative to the general annual inflation rate, how do you expect annual propane prices to change over the lifetime of the project?

What is the maximum fraction of your propane expenses that can be offset by waste heat from your energy recovery system (0 - 100%)?

The top part of this screen shows the current electricity usage and payments and the bottom part of the screen shows the current propane usage and payments. By default, upon entering this screen you may enter the energy usage (either in kWh electricity/year or gallons propane/year) and the price per unit of energy (either \$/kWh electricity or \$/gallon propane). Using these two numbers, FarmWare calculates the approximate annual electricity and propane bills. As shown in Figure 45, the farm uses 917,958 kWh per year at an average charge of \$0.06/kWh for a total annual electric bill of \$55,077 (917,958 kWh x \$0.06/kWh). Similarly, this farm uses 10,000 gallons per year of propane at an average price of \$0.90/gallon for an annual bill of \$9,000 for propane.

In addition to the energy usage and prices, the growth rates for electricity and propane may be edited if necessary in this screen. Also, the maximum fraction of the propane expenses that can be offset by waste heat from the methane recovery system should be edited.

Viewing Energy Payments

Monthly payments for both electricity and propane may be viewed by clicking on either the "View Electricity Payments" or "View Propane Payments" button. The **Analyze Electricity Payments** screen showing monthly electricity payments looks similar to Figure 46.

Figure 46: Analyze Electricity Payments Screen

	Peak kWh/hr	Energy (kWh)	Capacity (\$)	Energy (\$)	Fixed (\$)	Other (\$)	Total (\$)	Avg (\$/kWh)
January	131	77,964	\$0	\$4,678	\$0	\$0	\$4,678	\$0.0600
February	131	70,419	\$0	\$4,225	\$0	\$0	\$4,225	\$0.0600
March	131	77,964	\$0	\$4,678	\$0	\$0	\$4,678	\$0.0600
April	131	75,449	\$0	\$4,527	\$0	\$0	\$4,527	\$0.0600
May	131	77,964	\$0	\$4,678	\$0	\$0	\$4,678	\$0.0600
June	131	75,449	\$0	\$4,527	\$0	\$0	\$4,527	\$0.0600
July	131	77,964	\$0	\$4,678	\$0	\$0	\$4,678	\$0.0600
August	131	77,964	\$0	\$4,678	\$0	\$0	\$4,678	\$0.0600
September	131	75,449	\$0	\$4,527	\$0	\$0	\$4,527	\$0.0600
October	131	77,964	\$0	\$4,678	\$0	\$0	\$4,678	\$0.0600
November	131	75,449	\$0	\$4,527	\$0	\$0	\$4,527	\$0.0600
December	131	77,964	\$0	\$4,678	\$0	\$0	\$4,678	\$0.0600
Total	1,572	917,958	\$0	\$55,077	\$0	\$0	\$55,077	\$0.0600

Display which set of electricity payments?

☒ Payments made before energy recovery project
☐ Payments made after energy recovery project
☐ Payments received for electricity sold

OK Help

The left hand portion shows the peak kWh/hour and the total kWh for each month of the year. The right hand portion of the screen shows the detailed monthly electricity rate components including the capacity, energy, fixed, and other costs. In addition, the total cost per month and the average cost per kWh is displayed. These values may be viewed under each of the following scenarios:

- Payments made before energy recovery project
- Payments made after energy recovery project
- Payments received for electricity sold

You may select the electricity rate scenario from the box in the lower center of the screen. Note that none of the values may be edited in this screen.

Click on OK to exit.

The **Analyze Propane Payments** screen showing monthly propane payments looks similar to Figure 47.

Figure 47: Analyze Propane Payments Screen

Analyze Propane Payments									
	Before	Before	Before	Before	Digester	Digester	Digester	After	After
			Energy	Usable	Recovered	Recovered	Propane		
	Propane		Content	Heat	Heat	Used	Equiv.	Propane	Propane
	gallons	Payment	MMBTUs	MMBTUs	MMBTUs	MMBTUs	gallons	gallons	Payment
January	849.3	\$764	77.8	62.2	123.2	56.0	764.4	84.9	\$76
February	767.1	\$690	70.3	56.2	111.3	50.6	690.4	76.7	\$69
March	849.3	\$764	77.8	62.2	123.2	56.0	764.4	84.9	\$76
April	821.9	\$740	75.3	60.2	119.2	54.2	739.7	82.2	\$74
May	849.3	\$764	77.8	62.2	123.2	56.0	764.4	84.9	\$76
June	821.9	\$740	75.3	60.2	119.2	54.2	739.7	82.2	\$74
July	849.3	\$764	77.8	62.2	123.2	56.0	764.4	84.9	\$76
August	849.3	\$764	77.8	62.2	123.2	56.0	764.4	84.9	\$76
September	821.9	\$740	75.3	60.2	119.2	54.2	739.7	82.2	\$74
October	849.3	\$764	77.8	62.2	123.2	56.0	764.4	84.9	\$76
November	821.9	\$740	75.3	60.2	119.2	54.2	739.7	82.2	\$74
December	849.3	\$764	77.8	62.2	123.2	56.0	764.4	84.9	\$76
Total	10,000.0	\$9,000	916.0	732.8	1,450.4	659.5	9,000.0	1,000.0	\$900

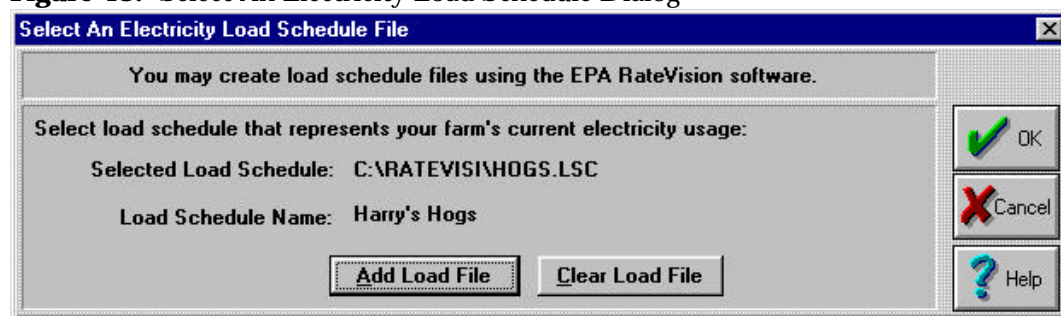
This screen is separated into three sections showing the propane payments before the digester; the recovered heat (in million BTUs) and propane equivalent; and the propane payments after the digester. You may need to use the scroll bars to view the far right hand corners of this table. This table is not editable.

Click on the upper right hand corner of this screen to close.

Enter Detailed Load Schedule

The electricity usage at a farm may be best described in a load schedule. Load schedules may be created and edited in the RateVision software program. A load schedule consists of daily and weekly load components which detail the amount of electricity used by the farm. A load schedule is saved in RateVision as a *.lsc file and may be imported in FarmWare to more accurately detail a farm's electricity usage.

To import a load schedule, click on the "Select a Load Schedule" button in the **Energy Usage and Payments** dialog. The **Select An Electricity Load Schedule File** dialog box pops up as shown in Figure 48 below.

Figure 48: Select An Electricity Load Schedule Dialog

A previously saved load file may be imported by clicking on the “Add Load File” button. The name of the saved load schedule are displayed in this screen. Click on OK to save and continue.

Note that upon adding a load schedule, the electricity usage field in the **Energy Usage and Payments** dialog becomes non-editable. If you wish to edit the annual electricity usage field, you must first click on the “Select a Load Schedule” button in the **Energy Usage and Payments** dialog and then click on the “Clear Load File” button in the **Select An Electricity Load Schedule File** dialog box.

Enter Detailed Rate Schedule

A rate schedule is an agreement between you and your local utility company that outlines the specific rates for electricity. There are many types of rate schedules using different terminology, values, and calculation methods for four basic components:

- **Fixed Charge:** Fixed charges are charges that are the same each month. A rate schedule may have one or more fixed monthly charges. Common names for fixed monthly charges include Customer Charge and Meter Charge. These charges usually vary by the size of the facility being served.
- **Demand Charge:** Demand charges are based on the capacity used, or the cost per kW of electricity used. Demand charges typically vary by time of year and peak utility season. Generally, summer demand charges are higher than winter demand charges. Some have multiple charges based on time of day.
- **Energy Charge:** Energy charges are based on the cost per kWh of electricity used. Energy charges vary by both time of year, time of day, and amount used (block rates). Generally, energy charges are highest during the mid-day hours.
- **Other Charges:** Other charges are charges that are not included in fixed monthly, demand or energy charges. This includes state and local taxes, environmental and DSM surcharges, and other user fees.

Together, these four charge elements determine your electricity bill. Understanding the details of your electricity rate schedule enables you to make informed decisions about your electricity options. Rate schedules may be created and edited in the RateVision software program. A rate schedule is saved in RateVision as a *.rat file and may be imported in FarmWare to more accurately detail a farm's electricity charges. More detailed information about RateVision and rate schedules may be found in Appendix D.

To import a rate schedule, click on the “Select a Rate Schedule” button in the **Energy Usage and Payments** dialog. The **Select An Electricity Rate Schedule File** dialog box pops up as shown in Figure 49 below.

Figure 49: Select An Electricity Rate Schedule Dialog

Select An Electricity Rate File

You may create rate schedule files using the EPA RateVision software.

Select rate schedule used to calculate your current electricity bill:

Select Rate File: C:\RATEVISI\SUNSHINE.RAT

Utility Name: Sparkle Electric Company

Rate Schedule Name: Large General Service Power Schedule 6

Add Rate File Clear Rate File

Select rate schedule used to calculate your electricity bill after installing a digester:
(Note: This often will be the same as your current rate schedule used above.)

Select Rate File: C:\RATEVISI\SUNSHINE.RAT

Utility Name: Sparkle Electric Company

Rate Schedule Name: Large General Service Power Schedule 6

Add Rate File Clear Rate File

Select rate used to sell any excess power to a utility:
(Note: This can be blank if there are no electricity sales off-farm.)

Select Rate File:

Utility Name: Default Utility

Rate Schedule Name: Default

Add Rate File Clear Rate File

OK Cancel Help

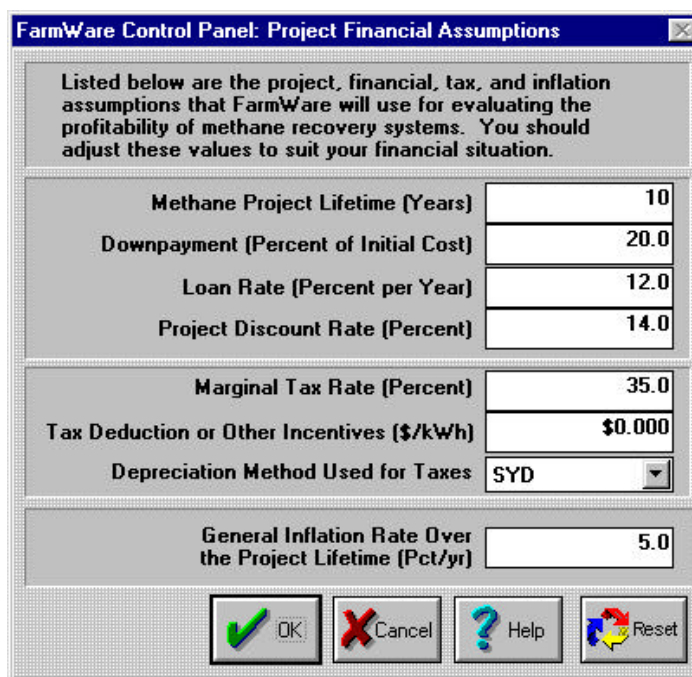
The following different rate schedules may be entered in this screen:

- Rate schedule used to calculate current electricity bill;
- Rate schedule used to calculate electricity bill after installing a digester (often the same as the current rate schedule); and
- Rate schedule used to sell excess electricity to a utility.

Note that upon adding one or more rate schedules, the electricity rate field in the **Energy Usage and Payments** dialog becomes non-editable. If you wish to edit the average price per kWh of electricity, you must first click on the "Select a Rate Schedule" button in the **Energy Usage and Payments** dialog and then click on the "Clear All" button in the upper left hand corner of the **Select An Electricity Rate Schedule File** dialog box.

Project Factors

The **Project Factors** screen allows you to view and/or edit the default project, financial, and tax assumptions that FarmWare uses to evaluate the profitability of methane recovery facilities. You may select the **Project Factors** screen only by selecting **Project Factors** from the **Design** menu. The **Project Financial Assumptions** screen looks similar to Figure 50.

Figure 50: Project Financial Assumptions screen

FarmWare Control Panel: Project Financial Assumptions

Listed below are the project, financial, tax, and inflation assumptions that FarmWare will use for evaluating the profitability of methane recovery systems. You should adjust these values to suit your financial situation.

Methane Project Lifetime (Years)	10
Downpayment (Percent of Initial Cost)	20.0
Loan Rate (Percent per Year)	12.0
Project Discount Rate (Percent)	14.0
Marginal Tax Rate (Percent)	35.0
Tax Deduction or Other Incentives (\$/kWh)	\$0.000
Depreciation Method Used for Taxes	SYD
General Inflation Rate Over the Project Lifetime (Pct/yr)	5.0

OK Cancel Help Reset

The project factors which may be edited in this screen include:

- Methane project lifetime (years)
- Downpayment (percent of initial cost)
- Loan rate (percent per year)
- Project Discount Rate (percent)
- Marginal tax rate (percent)
- Tax deduction and other incentives (\$/kWh)
- Depreciation method used for taxes
- General inflation rate (percent/year)

To edit one of these values, click in the appropriate white box, delete the current estimate, and enter the more accurate value.

*NOTE: You may also edit these figures in the **Cash Flow Report** screen.*

CHAPTER 5. METHANE RECOVERY COMPONENTS

A methane gas recovery project is comprised of different stages in the methane gas recovery process. The configuration of these stages is created in FarmWare after selecting a farm type including a manure collection system, manure treatment system, and a digester type. The visual display of this configuration is shown in the **Manure Management Train Screen** (see page C-11).

This chapter analyzes the different methane gas recovery stages and describes in detail the information required in each of the corresponding design screens.

Anaerobic Lagoon

The anaerobic lagoon control panel (Figure 51) allows you to edit the characteristics of a single cell methane recovery anaerobic lagoon designed to store manure and wastewater until it can be utilized. The top of this screen shows the amount of daily influent coming into the system. This influent is equal to the total manure and water influent plus the average rain influent minus the average evaporation. The amount of influent directly affects the size of the lagoon.

Any of the values in the cream colored boxes may be edited in this screen. These values include:

- HRT
- Loading Rate
- Depth
- Length/Width Ratio
- Sideslope
- Freeboard
- Average Evaporation
- Sludge Volume
- Sizing Method
- Watershed Runoff
- Cover Fraction
- Cover Material

These values may be edited by double clicking on the corresponding cream colored cell in the control panel. A dialog box will pop up in which you may edit the value or select a new option. *NOTE: The withdrawals option does not yet work in this screen.*

Figure 51: Anaerobic Lagoon Control Panel

	Quantity	Volume	TS	VS	N	P	K	TS
	lbs.	cu.ft.	lbs.	lbs.	lbs.	lbs.	lbs.	pct
Influent	459,856	7,407	10,575	9,488	0	0	0	2.29
plus Net Rainfall	45,300	730	0	0	0	0	0	0.00
minus Reduced by	30,112	485	3,764	7,528	0	0	0	12.50
equals Effluent	475,044	7,652	6,811	1,960	0	0	0	1.43

	Calculated	Size Method
HRT (days)	44	Max of HRT & Loading
Loading(lbVS/1000ft3)	10.0	
Depth (ft)	20.0	
Length/Width Ratio	1.00	Hold Watershed Runoff
Length(ft)	279	Yes
Width(ft)	279	
Side Slope(hor/ver)	2.5	
Freeboard (ft)	1.0	Cover Fraction
Avg Evap(in./month)	3.3	100
		Cover material
		Low durability (\$)

Minimum Volume 948,792
Sludge Volume 0
Net Rainfall Volume 38,974
OPERATING VOLUME 987,766
Freeboard Volume 76,374
TOTAL VOLUME (ft3) 1,064,140
Surface Area (sq.ft.) 77,841

Withdrawals

OK Cancel Help Reset

Collect Rainfall

The rainfall collection design screen (Figure 52) lets you calculate the average and maximum amount of runoff which may be expected given the location of the farm. You should enter the area over which rainfall runoff will be collected (acres) and the fraction of this area which is paved (%). These values may be edited by clicking on the corresponding white colored cell in the control panel, deleting the current value, and typing in the correct value.

Figure 52: Rainfall Collection Control Panel

	Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
No Manure	0	0	0	0	0	0	0	0.00
plus Rainfall	14,819	239	0	0	0	0	0	0.00
minus ---	0	0	0	0	0	0	0	0.00
equals Total Runoff	14,819	239	0	0	0	0	0	0.00

Manure contaminated runoff must be stored and utilized on the farm and may not be discharged into rivers, streams, lakes or other waters. The exception is for storms greater than the 25-yr, 24-hr storm.

This screen will let you calculate the average and maximum amount of runoff you should expect. This information will later be used to help size an appropriate containment structure (e.g., a lagoon or pond).

Enter the area over which runoff will be collected: Acres

Enter the fraction of this area that is paved: Percent

Runoff Volume Required for 25-yr, 24-hr storm: 17,424 cubic feet

Estimated runoff calculation parameters for your area:
(Modify under "Design | Site Location and Climate".)

25 Yr 24 hr Storm: 8 Inches of rain

Annual Runoff (Unpaved): 30 Percent of Precip.

Annual Runoff (Paved): 65 Percent of Precip.

Monthly Evaporation: 42 Inches

Buttons: OK, Cancel, Help, Reset

Complete Mix Digester

The complete mix digester screen (Figure 53) allows you to edit the characteristics of a complete mix digester methane recovery system. This screen always follows the **Mix Tank** screen (page C-35) in the manure management train.

Any of the values in the white boxes may be edited in this screen. These values include:

- HRT
- Sludge
- Freeboard
- Depth
- Biogas Production Rate
- Methane Percent of Biogas

These values may be edited by clicking on the corresponding white colored cell in the control panel, deleting the current value, and typing in the correct value.

Figure 53: Complete Mix Digester Control Panel

FarmWare Control Panel: Complete Mix Digester

		Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
	Influent	65,033	1,048	2,842	2,416	0	0	0	4.36
plus	---	0	0	0	0	0	0	0	0.00
minus	Digested	20,738	334	906	1,812	0	0	0	4.36
equals	Effluent	44,295	713	1,936	604	0	0	0	4.36

Digester Characteristics		Biogas Production Factors	
Select HRT (days)	<input type="text" value="20"/>	Rate (ft ³ /lbVS)	<input type="text" value="6.0"/>
Sludge Depth	<input type="text" value="1.0"/>	Methane Pct.	<input type="text" value="60"/>
Freeboard (ft)	<input type="text" value="1.0"/>		
Depth (ft)	<input type="text" value="10"/>		
Diameter	57.7	Biogas (ft ³ /day)	14,499
Volume (ft ³)	26,188		

Compost

The compost screen (Figure 54) allows you to edit the characteristics of a compost system. A compost system uses oxygen and aerobic bacteria to treat and stabilize the manure. The type of compost application equipment (windrow, static pile, in-vessel, or other) may be selected in this screen from the drop down menu.

Figure 54: Compost Control Panel

FarmWare Control Panel: Compost

		Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
	Influent	34,205	551	4,123	3,506	0	0	0	12.05
plus	---	0	0	0	0	0	0	0	0.00
minus	Removed	0	0	0	0	0	0	0	0.00
equals	Remaining	34,205	551	4,123	3,506	0	0	0	12.05

Type of Application Equipment:

Dry Application

The dry field application screen (Figure 55) allows you to enter the features of the dry manure application to the fields following storage or treatment. First, you may edit the amount of land (acres) on which the manure will be applied. Second, you may edit the frequency of the field application in terms of a number per time period (e.g., 1 time per month). The number of applications may be entered in the appropriate

box and the time period may be selected from the drop down list. Third, you may edit the type of manure application (e.g., Box-type spreader, dump truck, etc.) from the drop down list.

Figure 55: Dry Application Control Panel

	Quantity	Volume	TS	VS	N	P	K	TS
	lbs.	cu.ft.	lbs.	lbs.	lbs.	lbs.	lbs.	pct
Influent	103,120	1,661	12,357	10,509	0	0	0	11.98
plus ---	0	0	0	0	0	0	0	0.00
minus Field Applied	0	0	0	0	0	0	0	0.00
equals Remaining	103,120	1,661	12,357	10,509	0	0	0	11.98

Amount of Land: acres

Application Frequency: times per

Type of Appl. Equip.:

Buttons: OK, Cancel, Help, Reset

Drystack

The drystack screen (Figure 56) allows you to edit the features of the manure stored in a drystack. Drystack manure is scraped from a barn, feed lane, drylot, or other similar and stored in a pile until it can be utilized.

Any of the values in the white boxes may be edited in this screen. These values include:

- Storage Period
- Maximum Stack Height
- Height Allowance For Freeboard
- Stack Width
- Stack Length

These values may be edited by clicking on the corresponding white colored cell in the control panel, deleting the current value, and typing in the correct value.

Figure 56: Drystack Control Panel

		Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
	Influent	103,120	1,661	12,357	10,509	0	0	0	11.98
plus	Added	0	0	0	0	0	0	0	0.00
minus	Removed	0	0	0	0	0	0	0	0.00
equals	Effluent	103,120	1,661	12,357	10,509	0	0	0	11.98

Select the Storage Period: Days

Required Min. Effective Volume: cu.ft.

Select the Maximum Stack Height: feet

Calculate Manure Stack Design

Height allowance for freeboard: feet

Effective Stack Height: feet

Stack Width (display only):

Stack Length (display only):

Buttons: OK, Cancel, Help, Reset

Engine Generator

The methane utilization design screen (Figure 57) allows you to edit the characteristics of the engine generator. The amount of methane which is produced from the defined manure management system and available to be used in the engine generator is displayed at the top of this screen.

Any of the values in the white boxes may be edited in this screen. These values include:

- Fraction of Time the Utilization Equipment will be Running (%)
- Desired Generator Size (kW)
- Component Efficiency (BTU/kWh)
- Heat Recovery System
- O&M Costs (\$/kWh)
- Annual Growth Rate for O&M Costs (%)

These values may be edited by clicking on the corresponding white colored cell in the control panel, deleting the current value, and typing in the correct value.

Figure 57: Engine Generator Control Panel

FarmWare Control Panel: Methane Utilization Design

	Average	Minimum	Maximum
Methane Available (cu. ft. per day)	22,585	16,471	25,933

What fraction of the time will the utilization component be running? Percent (50 - 90)

The recommended engine-generator size is 77 kW capacity

Enter the engine-generator size you want kW capacity

Component Efficiency BTUs per kWh

Include Heat Recovery System?

O&M Costs per kWh of Use

Relative to the general annual inflation rate, how do you expect annual operating costs to change over the lifetime of the project?

Flush

The flush control panel (Figure 58) allows you to edit the characteristics of the flush facilities at the farm. First, you may edit the number of flush tanks or valves which are used in each facility. Second, you may also edit the flush frequency per day. Third, you may edit the amount of water used for each flush (gal/flush). These design parameters are very important as they directly affect the sizing of the manure treatment/storage facilities.

Figure 58: Flush Control Panel

FarmWare Control Panel: Flush

	Quantity	Volume	TS	VS	N	P	K	TS
	lbs.	cu. ft.	lbs.	lbs.	lbs.	lbs.	lbs.	pct
Manure	14,000	226	1,750	1,488	0	0	0	12.50
plus Flush Water	159,360	2,567	0	0	0	0	0	0.00
minus ---	0	0	0	0	0	0	0	0.00
equals Effluent	173,360	2,792	1,750	1,488	0	0	0	1.00

Number of Flush Tanks or Valves

Flush Frequency times/day

Water per Flush gallons/flush

Liquid Application

The liquid field application screen (Figure 59) allows you to enter the features of the liquid manure application to the fields following storage or treatment. First, you may edit the amount of land (acres) on which the manure will be applied. Second, you may edit the frequency of the field application in terms of a number per time period (e.g., 1 time per month). The number of applications may be entered in the appropriate box and the time period may be selected from the drop down list. Third, you may edit the type of application equipment (e.g., surface, handmove, stationary big gun, etc.) from the drop down list.

Figure 59: Liquid Application Control Panel

	Quantity lbs.	Volume cu. ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
Influent	1,182,888	19,053	4,418	1,143	0	0	0	0.37
plus	0	0	0	0	0	0	0	0.00
minus	0	0	0	0	0	0	0	0.00
equals	1,182,888	19,053	4,418	1,143	0	0	0	0.37

Amount of Land: acres

Application Frequency: times per

Type of Appl. Equip.:

Buttons: OK, Cancel, Help, Reset

Methane Recovery Lagoon

The methane recovery lagoon treatment option consists of two components in the manure management train: **Primary Lagoon** and **Secondary Lagoon**. The primary lagoon is a constant volume treatment lagoon which is covered partially or completely to trap the biogas which is produced. The secondary lagoon is a variable volume storage structure designed to store manure and wastewater until it can be utilized. Both the primary lagoon and secondary lagoon components must be designed in FarmWare for the Methane Recovery Lagoon system.

The amount of daily influent coming into each lagoon is displayed at the top of both the primary lagoon screen (Figure 60) and the secondary lagoon screen (Figure 61). The influent is equal to the total manure and water influent plus the average rain influent minus the average evaporation. The amount of influent directly affects the size of the lagoon.

The following design values may be edited in the cream colored cells in either of the screens:

- HRT
- Loading Rate
- Depth
- Length/Width Ratio
- Sideslope
- Freeboard
- Average Evaporation
- Sludge Volume
- Sizing Method
- Watershed Runoff
- Cover Fraction
- Cover Material (if cover fraction is >0%)

These values may be edited by double clicking on the corresponding cream colored cell in the control panel. A dialog box pops up in which you may edit the value or select a new option.

In general, the cover fraction for the primary lagoon is 100% or less while the cover fraction for the secondary lagoon is generally 0%. *NOTE: The withdrawals option does not yet work in this screen.*

Figure 60: Methane Recovery Lagoon Primary Cell Control Panel

Control Panel: Primary Cell of Double Cell

	Quantity	Volume	TS	VS	N	P	K	TS
	lbs.	cu.ft.	lbs.	lbs.	lbs.	lbs.	lbs.	pct
Influent	451,796	7,277	10,575	9,488	0	0	0	2.34
plus Net Rainfall	997	16	0	0	0	0	0	0.00
minus Reduced by	30,144	486	3,768	7,536	0	0	0	12.50
equals Effluent	422,649	6,807	6,807	1,952	0	0	0	1.61

	Calculated	Size Method
HRT (days)	44	Max of HRT & Loading
Loading(lbVS/1000ft3)	10.0	
Depth (ft)	20.0	
Length/Width Ratio	1.00	Hold Watershed Runoff
Length(ft)	265	No
Width(ft)	265	
Side Slope(hor/ver)	2.0	Cover Fraction
Freeboard (ft)	1.0	80
Avg Evap(in./month)	3.3	Cover material
		Low durability (\$)

	Minimum Volume	Sludge Volume	Net Rainfall Volume	OPERATING VOLUME	Freeboard Volume	TOTAL VOLUME (ft3)	Surface Area (sq.ft.)
	948,792	0	419	949,211	68,874	1,018,085	70,225

Auto-Withdrawals

OK Cancel Help Reset

Figure 61: Methane Recovery Lagoon Secondary Cell Control Panel

Control Panel: Secondary Cell of Double Cell

	Quantity	Volume	TS	VS	N	P	K	TS
	lbs.	cu.ft.	lbs.	lbs.	lbs.	lbs.	lbs.	pct
Influent	454,578	7,322	6,811	1,960	0	0	0	1.49
plus Net Rainfall	757	12	0	0	0	0	0	0.00
minus Reduced by	246	4	31	62	0	0	0	12.50
equals Effluent	455,089	7,330	6,780	1,898	0	0	0	1.48

	Calculated	Size Method
HRT (days)	90	Use HRT
Loading(lbVS/1000ft3)	7.5	
Depth (ft)	20.0	
Length/Width Ratio	1.00	Hold Watershed Runoff
Length(ft)	231	Yes
Width(ft)	231	
Side Slope(hor/ver)	2.0	Cover Fraction
Freeboard (ft)	1.0	0
Avg Evap(in./month)	3.3	

	Minimum Volume	Sludge Volume	Net Rainfall Volume	OPERATING VOLUME	Freeboard Volume	TOTAL VOLUME (ft3)	Surface Area (sq.ft.)
	658,979	0	27,817	686,796	52,377	739,172	53,361

Withdrawals

OK Cancel Help Reset

Mix Tank

The mix tank design screen (Figure 62) precedes both the plug flow digester design screen and the complete mix digester design screen. The following tank sizing parameters may be edited in this screen if necessary:

- Storage Period
- Added Water
- Mix Tank Depth
- Mix Tank Freeboard
- Mix Tank Length
- Mix Tank Width

These values may be edited by clicking on the corresponding white colored cell in the control panel, deleting the current value, and typing in the correct value.

NOTE: The complete mix digester or plug flow digester design screen should be viewed and edited if necessary after changing any of the defaults in this mix tank design screen.

Figure 62: Mix Tank Control Panel

	Quantity	Volume	TS	VS	N	P	K	TS
	lbs.	cu.ft.	lbs.	lbs.	lbs.	lbs.	lbs.	pct
Influent	110,501	1,780	3,600	3,240	0	0	0	3.25
plus Added Water	0	0	0	0	0	0	0	0.00
minus ---	0	0	0	0	0	0	0	0.00
equals Effluent	110,501	1,780	3,600	3,240	0	0	0	3.25

Enter the retention period (e.g., 2 days) and add water to adjust the TS percent.

Storage Period: Days

Added water: gallons/day

Mix Tank Depth: feet

Mix Tank Freeboard: feet

Mix Tank Length: feet

Mix Tank Width: feet

Buttons: OK, Cancel, Help, Reset

Plug Flow Digester

The plug flow digester screen (Figure 63) allows you to edit the characteristics of a plug flow digester methane recovery system. This screen always follows the **Mix Tank** screen (page C-35) in the manure management train. Plug flow digesters are used only at dairies where the manure is scraped and the solids content therefore of the influent manure is 10-12%.

Any of the values in the white boxes may be edited in this screen. These values include:

- HRT
- Sludge
- Freeboard
- Depth
- Biogas Production Rate
- Methane Percent of Biogas

These values may be edited by clicking on the corresponding white colored cell in the control panel, deleting the current value, and typing in the correct value.

Figure 63: Plug Flow Digester Control Panel

FarmWare Control Panel: Plug Flow Digester

		Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
	Influent	34,205	551	4,123	3,506	0	0	0	12.05
plus	---	0	0	0	0	0	0	0	0.00
minus	Digested	10,908	176	1,315	2,630	0	0	0	12.05
equals	Effluent	23,297	375	2,808	877	0	0	0	12.05

Digester Characteristics		Biogas Production Factors	
Select HRT (days)	20	Rate (ft ³ /lbVS)	6.0
Length/Width Ratio	4.5	Methane Pct.	60
Freeboard (ft)	1.0	Biogas (ft ³ /day)	21,037
Depth (ft)	10		
Width	17.5		
Length	78.7		
Volume (ft ³)	13,774		

Process Water

The amount of process water added to the manure collection and treatment facilities must be accounted for to accurately size the manure management components. The process water screen (Figure 64) allows you to enter the approximate amount of process water that ends up in the manure management system in gallons/day.

Figure 64: Process Water Control Panel

FarmWare Control Panel: Process Water

		Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
	No Manure	0	0	0	0	0	0	0	0.00
plus	Process Water	415,000	6,684	0	0	0	0	0	0.00
minus	---	0	0	0	0	0	0	0	0.00
equals	Effluent	415,000	6,684	0	0	0	0	0	0.00

Enter daily process water usage that ends up in the manure management system. Process water is assumed to be fresh.

Process Water gallons/day

Pull Plug Pit

The pull plug pit control panel (Figure 65) allows you to edit the characteristics of the pull plug collection systems at the farm. Two features may be edited in this design screen: (1) the storage period (days) and (2) the amount of recharge water added to the pit (ft). The recharge water is assumed to be added at the beginning of the storage period just after the pits have been emptied.

Figure 65: Pull Plug Pit Control Panel

FarmWare Control Panel: Pit Storage

	Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
Manure	105,893	1,706	10,575	9,488	0	0	0	9.98
plus Recharge Water	345,904	5,572	0	0	0	0	0	0.00
minus ---	0	0	0	0	0	0	0	0.00
equals Effluent	451,796	7,277	10,575	9,488	0	0	0	2.34

Enter the storage period (i.e., time between emptying the pits) and the amount of recharge water** added.

Storage Period Days

Recharge water ** gallons

** Recharge water is assumed to be added at the beginning of the storage period, just after the pits have been emptied.

OK Cancel Help Reset

Scrape

The scrape control panel (Figure 66) allows you to edit the characteristics of the scrape facilities at the farm. Two features may be edited in this design screen. First, you may edit the frequency of the scrape collection system in terms of a number per time period (e.g., 2 times per day). You may enter the number of scrapes in the appropriate box and select the time period from the drop down list. Second, you may edit the type of scraper which is used from the drop down list.

Figure 66: Scrape Control Panel

FarmWare Control Panel: Scrape

	Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
Manure	34,709	559	4,111	3,497	0	0	0	11.84
plus ---	0	0	0	0	0	0	0	0.00
minus Removed	0	0	0	0	0	0	0	0.00
equals Effluent	34,709	559	4,111	3,497	0	0	0	11.84

Scrape Frequency times per

Type of Scraper

OK Cancel Help Reset

Solids Separator

The solid separator control panel (Figure 67) allows you to edit the characteristics of the solids separator at the farm. The first feature which may be edited in this design screen is the type of separator which is being used. The separator type may be chosen from several options listed in type of separator drop down list.

Each separator type has certain default characteristics including influent TS concentration (%), solid separator efficiency (%), and influent capacity (gal/min) which are displayed in this screen. These default parameters may be edited by clicking in the box you wish to edit, deleting the current value, and entering the more accurate one. In particular, you should be sure that the influent capacity is large enough to handle the manure influent which is displayed at the top of this screen.

Figure 67: Solid Separator Control Panel

		Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
	Influent	1,156,666	18,631	7,433	6,320	0	0	0	0.64
plus	---	0	0	0	0	0	0	0	0.00
minus	Separated	2,973	48	743	632	0	0	0	25.00
equals	Effluent	1,153,693	18,583	6,690	5,688	0	0	0	0.57

Select the Type of Separator: Vibrating Screen - 16 mesh

Maximum Influent TS Concentration: 5.0 Percent (approx.)

Solids Separation Efficiency: 10.0 Percent (approx.)

VS Reduction Efficiency: 0.0 Percent (approx.)

Influent Capacity: 300.0 Gal per min (approx.)

Buttons: OK, Cancel, Help, Reset

Storage Pond

The storage pond control panel (Figure 68) allows you to edit the characteristics of the manure storage pond. A storage pond is defined in FarmWare as an earthen basin designed to store manure and wastewater until it can be utilized. The top of this screen shows the amount of daily influent coming into the system. This influent is equal to the total manure and water influent plus the average rain influent minus the average evaporation. The amount of influent directly affects the size of the pond.

Any of the values in the cream colored boxes may be edited in this screen. These values include:

- HRT
- Loading Rate
- Depth
- Length/Width Ratio
- Sideslope
- Freeboard
- Average Evaporation
- Sludge Volume
- Sizing Method
- Watershed Runoff
- Cover Fraction
- Cover Material (if Cover Fraction is >0%)

These values may be edited by double clicking on the corresponding cream colored cell in the control panel. A dialog box will pop up in which you may edit the value or select a new option.

NOTE: The withdrawals option does not yet work in this screen.

Figure 68: Storage Pond Control Panel

	Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
Influent	459,856	7,407	10,575	9,488	0	0	0	2.29
plus Net Rainfall	930	15	0	0	0	0	0	0.00
minus Reduced by	29,959	483	3,745	7,490	0	0	0	12.50
equals Effluent	430,827	6,939	6,830	1,998	0	0	0	1.58

	Calculated	Size Method
HRT (days)	90	Use HRT
Loading(lbVS/1000ft3)	0.0	
Depth (ft)	15.0	
Length/Width Ratio	1.00	Hold Watershed Runoff
Length(ft)	256	Yes
Width(ft)	256	
Side Slope(hor/ver)	2.0	Cover Fraction
Freeboard (ft)	1.0	0
Avg Evap(in./month)	3.3	

	Minimum Volume	Sludge Volume	Net Rainfall Volume	OPERATING VOLUME	Freeboard Volume	TOTAL VOLUME (ft3)	Surface Area (sq.ft.)
	666,629	0	34,164	700,794	64,087	764,881	65,536

Withdrawals

OK Cancel Help Reset

Storage Tank

The storage tank control panel (Figure 69) allows you to edit the characteristics of the manure storage tank. A storage pond is defined in FarmWare as a concrete or metal tank designed to store manure and wastewater until it can be utilized. The top of this screen shows the amount of daily influent coming into the system. This influent is equal to the total manure and water influent plus the average rain influent minus the average evaporation. The amount of influent directly affects the size of the tank.

Any of the values in the white boxes may be edited in this screen. These values include:

- Storage Period
- Tank Height
- Estimated Rain During Storage Period
- Height Allowance for Solids
- Height Allowance for Freeboard
- Tank Type

These values may be edited by clicking on the corresponding white colored cell in the control panel, deleting the current value, and typing in the correct value.

Figure 69: Storage Tank Control Panel

FarmWare Control Panel: Storage Tank

		Quantity lbs.	Volume cu.ft.	TS lbs.	VS lbs.	N lbs.	P lbs.	K lbs.	TS pct
	Influent	185,002	2,980	3,600	3,240	0	0	0	1.94
plus	Rainfall	0	0	0	0	0	0	0	0.00
minus	Removed	0	0	0	0	0	0	0	0.00
equals	Effluent	185,002	2,980	3,600	3,240	0	0	0	1.94

Select the Storage Period Days

Required Min. Effective Volume 268,187 cu.ft.

Select the Total Tank Height feet

Select Tank Type

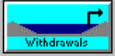
Calculate Storage Tank Design

Est. rain during storage period in. Diameter 166.1 feet

Height allowance for solids feet Surface 21,669 sq.ft.

Height allow. for freeboard feet

Effective Tank Height 12.4 feet

 Withdrawals

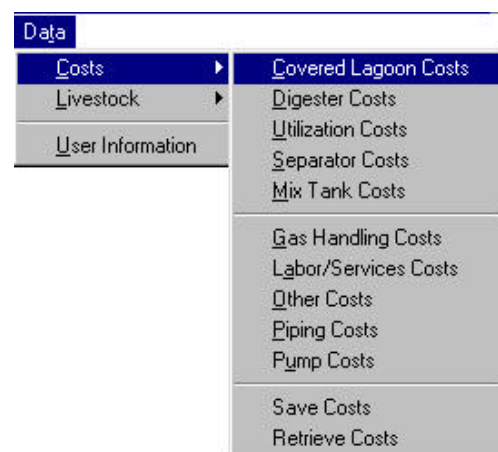
OK Cancel Help Reset

CHAPTER 6. CHANGING DEFAULT COSTS

FarmWare uses default costs for each of the manure management components in the methane recovery system. These default costs should be edited if necessary to provide a more realistic estimate of the costs and benefits associated with a FarmWare designed methane recovery system.

To edit the default costs, click on the **Data** menu and then click on the **Costs** item. The Costs submenu (Figure 70) contains a listing of the following cost components associated with a methane recovery project:

- Covered Lagoon Costs
- Digester Costs
- Utilization Costs
- Separator Costs
- Mix Tank Costs
- Gas Handling Costs
- Labor/Services Costs
- Piping Costs
- Pump Costs

Figure 70: Data/Costs menu

Any one of these cost components may be selected to view the default subcosts. For example, the individual subcosts for the utilization equipment are shown in the **Utilization Equipment Cost Table** in Figure 71 below:

Figure 71: Utilization Equipment Cost Table

Utilization Equipment Costs		
Elec gen w/ heat rec(\$/kW cap)	\$1,050	F2 or dbl clk to change a value
Elec gen w/o heat rec(\$/kW cap)	\$600	
Elec gen O&M (\$/kWh)	\$0.015	
Elec gen bldg (\$/per)	\$10,000	
Switch gear (\$/per)	\$5,000	
Boiler cost (\$/per)	\$10,000	
Boiler O&M (\$/yr)	\$0.000	
Boiler shed (\$/per)	\$3,500	
Chiller (\$/ton cap)	\$1,050	
Chiller O&M (\$/ton-hr)	\$0.015	
Flare (\$/per)	\$10,000	
Flare O&M (\$/yr)	\$0.000	
Other Costs	\$0	
Other Costs	\$0	
Other Costs	\$0	
Other Costs	\$0	
Other Costs	\$0	

This table shows that the default cost for an engine generator with heat recovery is \$1,050/kW and for an engine generator without heat recovery is \$600/kW. Similarly, this table shows the default electricity and

generation O&M costs are \$0.015/kWh, the engine generator building is \$10,000, the switch gear is \$5,000, and so on. Any one of these default values may be edited.

Editing Default Costs

To edit a default cost, click on the cell displaying the cost and then click on the change cost button (Figure 72) in the floating toolbar. The **Select Cost Basis** screen pops up as shown in Figure 73 below.

Figure 72:
Change cost button



Figure 73: Select Cost Basis Screen

To change the default value, first select **Select Your Own Value** from the “Select Cost Basis” drop down list. Then, enter the changed cost value in the “Enter Your Value” field. Finally, click on the OK button to save and continue. Changed costs are reflected in the cost tables in red color.

Changed costs may be reset to the default values by clicking on the restore button **Figure 74:** Restore button (Figure 74) in the floating toolbar.



Adding New Costs

If a cost component is not listed in the cost table, a new component may be added.

To add a new component, first click on a cream colored cell adjacent to “Other Costs”. Then click on the change costs button (Figure 72) in the floating toolbar to open the **Select a Cost Basis** screen (Figure 73). Then, follow the above instructions for changing a default cost and add a label describing this “other cost”. The label and the cost are displayed in the table after clicking OK.

Saving and Retrieving Changed Costs

You may wish to save changed costs such that they may be retrieved in a later FarmWare session. To save the costs, select **Save Costs** from the **Data | Costs** menu. Enter the name of this cost file (saved as *.cst) and click on OK. Note that the costs for each component are saved. To retrieve a previously saved cost file, select **Retrieve Costs** from the **Data | Costs** menu. Enter the name of this cost file to be retrieved and click on OK.

CHAPTER 7. ANALYZING THE COSTS AND BENEFITS

After entering all of the information required in the **Design** menu you may analyze the costs and benefits of the proposed methane recovery system. This chapter describes the analysis screens in FarmWare. These features may be accessed through the options under the **Analysis** menu (Figure 75).

Note: Analyses performed using FarmWare are considered preliminary and are to be used for guidance only. The results presented are based on input values. Input errors or omissions affect the results presented. A detailed final feasibility assessment should be completed by qualified agricultural and energy engineers prior to any design, construction, or purchase of materials.

Quick Financial Results

The **Quick Financial Results** screen shows an overview of the costs and benefits of the methane recovery system. To view the **Quick Financial Results**, select **Quick Report** from the **Analysis** menu or click on the quick report icon (Figure 76) on the toolbar. You should see a box similar to Figure 77.

The top of the box contains estimates for the total capital costs, annual benefits, and annual operating costs of the selected system. The bottom of the box contains values for the NPV, simple payback, NPV payback, approximate IRR, and a message regarding the potential profitability of the selected system.

This screen may be kept open in the FarmWare window and may be updated after design changes are made. For example, if you want to see the effects of increasing the number of animals at the farm, you could change the number of head in the **Livestock Number** screen and then click on the **Update Now** button in the **Quick Financial Results** screen to see the results.

This screen may be closed by clicking on the **Close** button.

Note: More detailed financial results may be viewed in the Cash Flow Report screen.

Summary Report

The **Summary Report** is a comprehensive report detailing the methane recovery project design and potential costs and benefits. The summary report may be accessed by clicking on the summary report icon (Figure 78) on the toolbar or by selecting **Summary Report** from the **Analysis** menu.

The **Summary Report** is displayed in the FarmWare word processor. To save this file, select **Save** from the FarmWare word processor **File** menu. The file is saved in rich text format (*.RTF), a format compatible with any word processor.

The FarmWare word processor may be closed by double clicking in the upper left hand corner.

Figure 75: Analysis menu



Figure 76: Quick report icon



Figure 77: Quick Financial Results screen

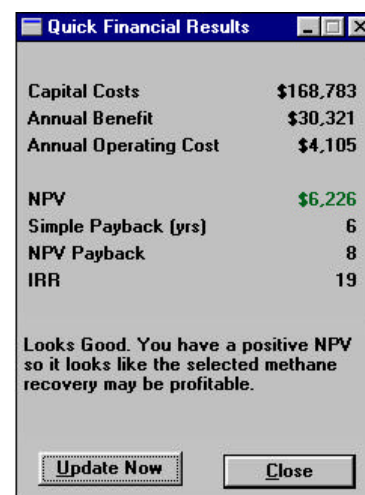


Figure 78: Summary report icon



Cashflow Report

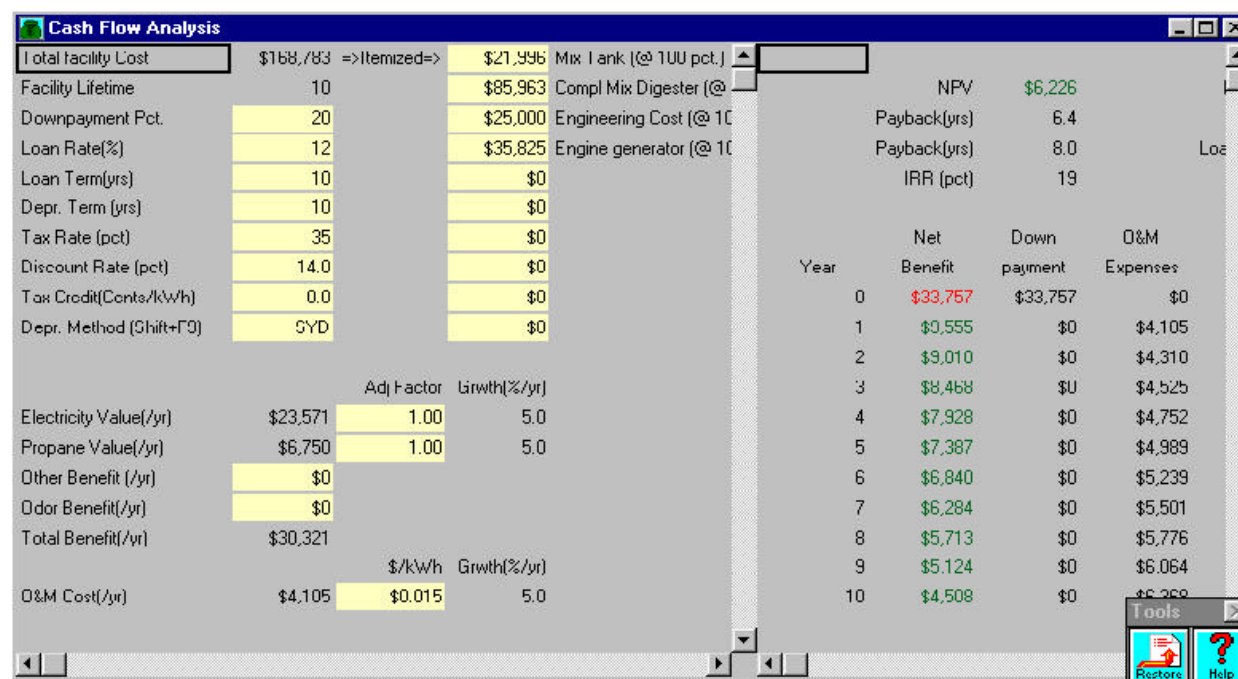
The **Cashflow Report** shows the cost breakdown and cash flow associated with the methane recovery project. To view this analysis, click on the cashflow report icon (Figure 79) on the tool bar or select **Cash Flow Report** from the **Analysis** menu.

Figure 79: Cashflow icon



A split screen similar to Figure 80 is displayed.

Figure 80: Cashflow Analysis screen



The left hand side of the report contains a simple economic summary of the costs associated with the defined system. The top part of this side shows system costs and project financial assumptions while the bottom part shows the summary of the energy and odor benefits. You may change the value of any of the cream colored cells by clicking on the cell you wish to edit, deleting the current value, and entering the correct one.

The right hand side of the report contains a year by year financial expense and benefit breakdown. The top part of this side shows a simple economic summary including the NPV, IRR, and yearly loan payment. The most important value here is the NPV as it is a simple indicator of profitability. Any system with an NPV greater than or equal to zero should be beneficial. A system with a negative NPV may not be profitable but should be examined for potential methods of expense cuts and reanalyzed for profitability. The bottom part of this side of the screen shows a year by year cost expense and benefit breakdown. The net benefit column is the difference between the total cost benefit minus the total cost expense for the year. Cost benefits include energy, odor, and tax benefits while expenses include loan payments, operation and maintenance costs, and depreciation and interest expenses. A profitable system will have positive yearly net benefits for the majority of the years in the system lifetime.

The **Cashflow Report** may be printed by clicking on the print button on the toolbar. The printout is displayed in several tables in the FarmWare word processor. To save this printout, select **Save** from the FarmWare word processor **File** menu. The file is saved in rich text format (*.RTF), a format compatible with any word processor.

The **Cashflow Report** may be closed by double clicking in the upper left hand corner of the screen.

Farm Energy Balance

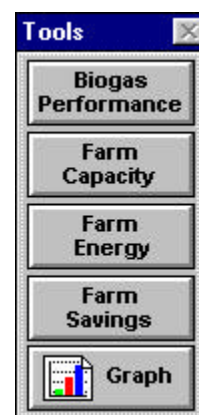
The Farm Balance option allows you to view various tables showing the energy production and electricity savings. The Farm Balance option may be selected by clicking on the energy balance icon (Figure 81) on the toolbar or by selecting **Farm Energy Balance** from the **Analysis** menu.

The Farm Energy Balance option has four tables available for viewing: **Biogas Performance**, **Farm Capacity**, **Farm Energy**, and **Farm Savings**. All four of the tables show the results for each month throughout the year. A particular table may be selected by clicking on the corresponding name in the floating toolbar (Figure 82) or by selecting the table name from the **Tools** menu. A four table may be graphed by clicking on the graph button. A table may also be printed by clicking on the print icon on the main toolbar.

Figure 81: Energy balance icon



Figure 82: Farm Energy Balance Floating Toolbar



CHAPTER 8. HELP AND OTHER FEATURES

FarmWare contains help and other features which may assist you when using the program. These features are described below.

Help

The **Help** menu (Figure 83) provides information about FarmWare's features and options through FarmWare's on-line Help system.

Figure 83: Help menu



Contents

The **Contents** option is available to access the FarmWare on-line help. The on-line help is outlined in the same manner as this manual and provides basic help for each of the screens in FarmWare. The online Help system contains hypertext jump topics which move you to other topics and pop-up topics which display definitions or other information. These jump topics and pop-up topics are green and may be selected by clicking on the text.

Keyword

The **Keyword** option is available to access the FarmWare context specific on-line help. While in a screen with a table the **Keyword** option may be clicked to access help for that particular screen. Dialog boxes do not have this feature however they do have help buttons which access the context specific help for the specific dialog boxes.

About

Select **About** from the **Help** menu to see information about your version of FarmWare.

Window Options

The **Window** menu (Figure 84) provides options for you to view the data in the document windows on your screen. The features provided in this menu allow you to open, move, size, and arrange many document windows at one time. The basic controls which allow you to size and arrange the windows include restore, minimize, and maximize. These controls are described below.

Figure 84: Window menu



When you restore a window, you change it to a previous or medium size which you can then move, size, and close. To restore a maximized document window, click the document Restore button in the upper-left hand corner of a maximized document window or choose Restore from the document Control menu. The document Control menu is the menu containing the commands that will open, close, maximize, minimize, or restore a window. You can display the Control menu by clicking on the small rectangular button in the upper left corner of a window or by pressing Alt+space bar. To restore a minimized document, double-click on the document icon or click on a document icon to open the Control menu and choose Restore. A document window is also restored (unless it is minimized) when you tile or cascade windows.

When you minimize a window the window is reduced to an icon allowing you to keep several documents open at the same time. To minimize a restored document, click the minimize arrow (down arrow) in the upper-right hand corner of the document window or choose minimize from the document Control menu.

When you maximize a document window, the document enlarges to fill up the entire document area. To maximize a restored document, click the maximize arrow (up arrow) in the upper-right corner of the document window or double-click on the title bar. To maximize a minimized document, click on a document icon to open the Control menu and choose Maximize.

The Window menu on the menu bar of FarmWare contains the following additional controls which allow you to size and arrange the FarmWare windows:

Cascade

When you have more than one document window open (but not minimized), you can select **Cascade** from the **Window** menu or press Shift+F5 to restore and arrange the open windows. Cascaded windows overlap so that the title bar of each window is displayed. Click on the title bar to view a window's contents.

Tile

When you have more than one document window open (but not minimized), you can select **Tile** from the **Window** menu or press Shift+F4 to restore and arrange the open windows. Tiled windows are arranged on the screen with no overlapping. To work on one of the windows, click on the title bar of the desired window.

Arrange Icons

When you have one or more windows minimized to icons you may wish to arrange the icons so that they are ordered and easy to view. To arrange the icons, select **Arrange Icons** from the **Windows** menu.

Close All

To close all open windows, select **Close All** from the **Window** menu.

Minimize All

To minimize all open windows to icons, select **Minimize All** from the **Window** menu. The minimized icons are displayed on the bottom of the screen.

Restore All

To restore all windows to the maximum size, select **Restore All** from the **Window** menu.

INDEX

2	
25 year, 24 hour storm event	
entering value	8
A	
Adding New Costs	44
Anaerobic Lagoon Control Panel	27
Analysis	45
Analysis menu	45
Cashflow Report	46
Farm Energy Balance	47
Quick Financial Results	45
Summary Report	45
Annual evaporation	
entering value	8
Annual runoff of paved surfaces	
entering value	8
Annual runoff of unpaved surfaces	
entering value	8
C	
Cash Flow Report	
economic summary of the costs	46
financial expense and benefit breakdown	46
Cashflow Report	46
Change Component	12
Change Livestock	17
Changing Default Costs	43
Close Current FarmWare Session	5
Collect Rainfall Control Panel	28
Complete Mix Digester Control Panel	29
Compost Control Panel	30
Custom climate data	
retrieving.....	9
saving.....	9
Customer Charge	24
D	
Default Monthly Temperature and Rainfall	
editing values.....	8
Demand Charge	24
Design Component	13
Design Menu.....	7
Energy Prices.....	20
Farm Type.....	9
Livestock Facilities	18
Livestock Number.....	17
Location and Climate.....	7
Management Train.....	11
Other Benefits.....	19
Project Factors	25
Dry Application Control Panel.....	31
Drystack Control Panel	31
E	
Editing Default Costs	44
Energy Charge	24
Energy Prices	20
Engine Generator Control Panel.....	32
Enter Detailed Load Schedule.....	23
Enter Detailed Rate Schedule.....	24
Erase Component	12
Exit FarmWare	6
F	
Farm Design	7
Farm Energy Balance	
Biogas Performance.....	47
Farm Capacity.....	47
Farm Energy.....	47
Farm Savings.....	47
Floating Toolbar	47
Farm Energy Balance	47
Farm Type	9
farm size.....	10
manure collection method	10
manure treatment/storage facility	10
separator and digester	10
type of farm.....	10
FarmWare Interview.....	3
Energy Prices.....	4
Farm Type.....	3
Odor and Other Benefits.....	4
Project Financial Assumptions	4
Quick Report	4
Site Location and Climate	3
File menu.....	5

Close Current FarmWare Session	5	Dry Application	31
Exit FarmWare	6	Drystack	31
Open Existing FarmWare Session	5	Engine Generator	32
Print	6	Flush	33
Save FarmWare Session	5	Liquid Application	34
Save FarmWare Session As... ..	5	Methane Recovery Lagoon	34
Flush Control Panel	33	Mix Tank	36
H		Plug Flow Digester	37
Help	49	Process Water	38
Help menu	49	Pull Plug Pit	38
About	49	Scrape	39
Contents	49	Solids Separator	40
Keyword	49	Storage Pond	40
I		Storage Tank	41
Inspect Costs	16	Mix Tank Control Panel	36
Inspect Methane	15	N	
Installation Instructions	1	New FarmWare Session	5
Installing the FarmWare Software	1	O	
Introduction	1	Open Existing FarmWare Session	5
L		Opening, Closing, and Saving FarmWare Sessions	5
Liquid Application Control Panel	34	Other Benefits	19
Livestock Facilities	18	Other Charge	24
Livestock Number	17	Other Features of FarmWare	49
change livestock number	17	P	
Location and Climate	7	Plug Flow Digester Control Panel	37
retrieving custom climate data	9	Primary Lagoon Control Panel	34
saving custom climate data	9	Print	6
M		Process Water Control Panel	38
Management Train	11	Project Factors	25
Management Train Floating Toolbar		Pull Plug Pit Control Panel	38
Change Component	12	Q	
Design Component	13	Quick Financial Results	45
Erase Component	12	R	
Inspect Costs	16	Rainfall Collection Control Panel	28
Inspect Methane	15	Recommended Equipment	1
Set Cost Fraction	14	Recommended maximum lagoon loading entering value	8
Manure management train	11	Recommended minimum lagoon HRT entering value	8
Meter Charge	24	Required Equipment	1
Methane Recovery Components	27		
Anaerobic Lagoon	27		
Collect Rainfall	28		
Complete Mix Digester	29		
Compost	30		

S

Save FarmWare Session.....	5
Save FarmWare Session As....	5
Saving and Retrieving Changed Costs	44
Scrape Control Panel	39
Secondary Lagoon Control Panel.....	34
Set Cost Fraction	14
Site Location and Climate	
farm state and county	8
Solids Separator Control Panel.....	40
Storage Pond Control Panel.....	40
Storage Tank Control Panel.....	41
Summary Report.....	45

T

The FarmWare Package	1
----------------------------	---

U

User Information	6
------------------------	---

V

Viewing Energy Payments	21
-------------------------------	----

W

Window.....	49
Window menu.....	49
Arrange Icons	50
Cascade	50
Close All.....	50
Minimize All	50
Restore All.....	50
Tile.....	50